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Montgomery, Vermont Flood Hazard Modeling & Project Identification

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Lauren Weston – District Manager, Franklin County NRCD

December 12, 2024

SLR

Flood Hazard Modeling & Project Identification

Understand Flood Issues and Patterns

- Aerial survey
- Bridge surveys
- Hydraulic models

Identify Possible Mitigation Projects

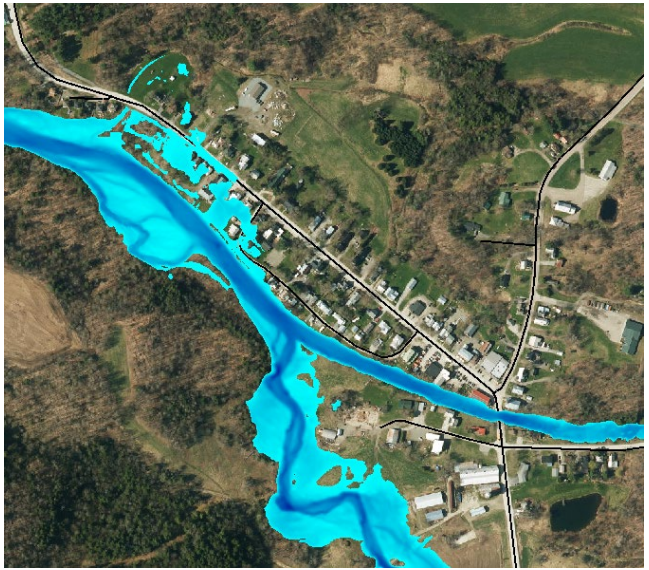
- Visit sites
- Collect ideas from residents

Test Identified Alternatives

- Model possible projects in hydraulic model
- Consider constraints and project goals

Concept Design

- Develop the top 5 projects to start the design process



DISCUSS TODAY

Flood Mitigation Project – Selected Alternatives

ID	Location	Description
1	Black Falls Brook Confluence with Trout River	Floodplain / Wetland Restoration at 251 Fuller Bridge Road
2	Route 118 at West Hill Brook	Sediment Management
7	Fuller Bridge at Black Falls Brook	Overflow Capacity / Regain Channel Capacity
9	Black Falls Road at Black Falls Brook	Move Road and Restore Floodplain
11	Trout River below Center	Remove gravel deposits around boulder / valley constriction
12	Trout River in Center	Floodplain reconnection on Trout River
15	Trout River in Center	Bridge Replacement and Restore Floodplain

The next slides will walk through each alternative and results

Alternative 1 – Floodplain & Wetland Restoration

- Floodplain and Wetland Restoration at 251 Fuller Bridge Road
- Small footprint moved to concept design

Date Saved: 12/12/2024
Document Path: Y:\13528.00001\Map\Montgomery_Concepts.aprx

ALTERNATIVE 1 - EXISTING CONDITIONS

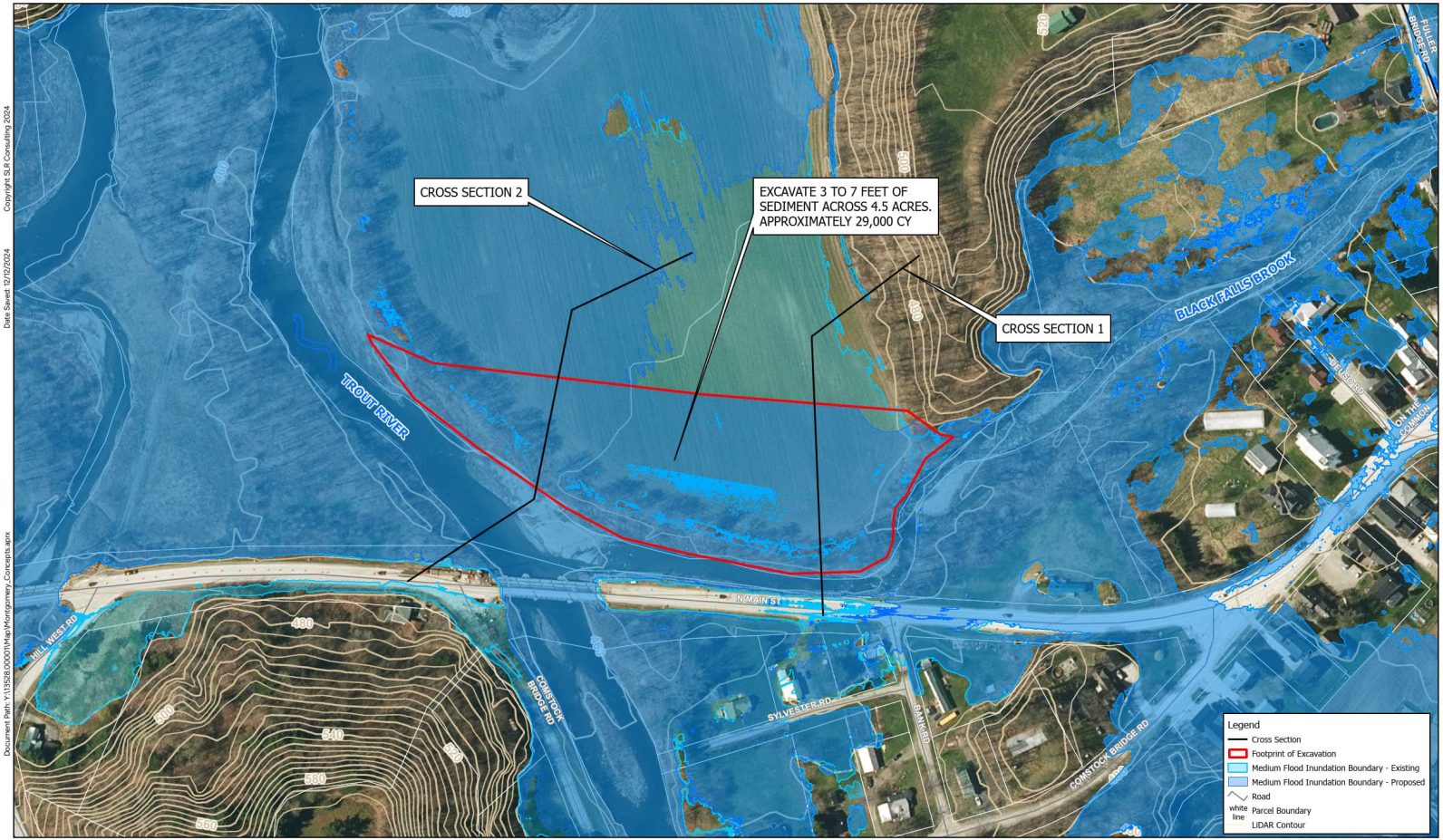
MONTGOMERY FLOOD HAZARD MITIGATION STUDY
FRANKLIN COUNTY NATURAL RESOURCES CONSERVATION DISTRICT

1:1,800

0 150 300
Feet
1 inch = 150 feet

N

SLR
1 SOUTH MAIN STREET
SECOND FLOOR
WATERBURY, VT 05676
802.882.8335



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ALTERNATIVE 1 - PROPOSED CONDITIONS

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FRANKLIN COUNTY NATURAL RESOURCES CONSERVATION DISTRICT

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Feet

1 inch = 150 feet

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SLR

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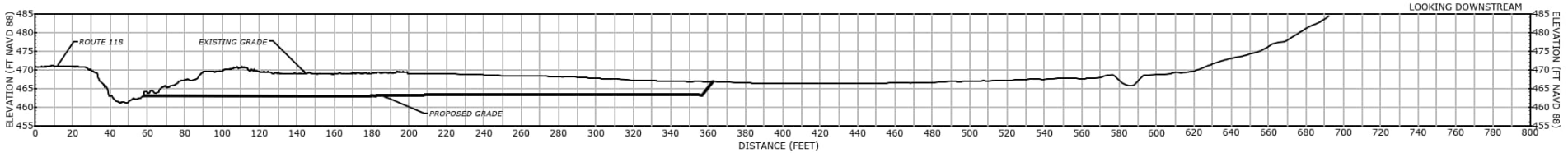
Alternative 1 – Floodplain & Wetland Restoration



ALTERNATIVE 1 CROSS SECTION 1
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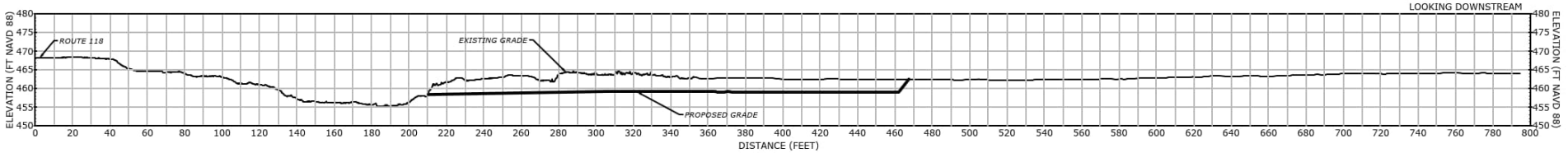
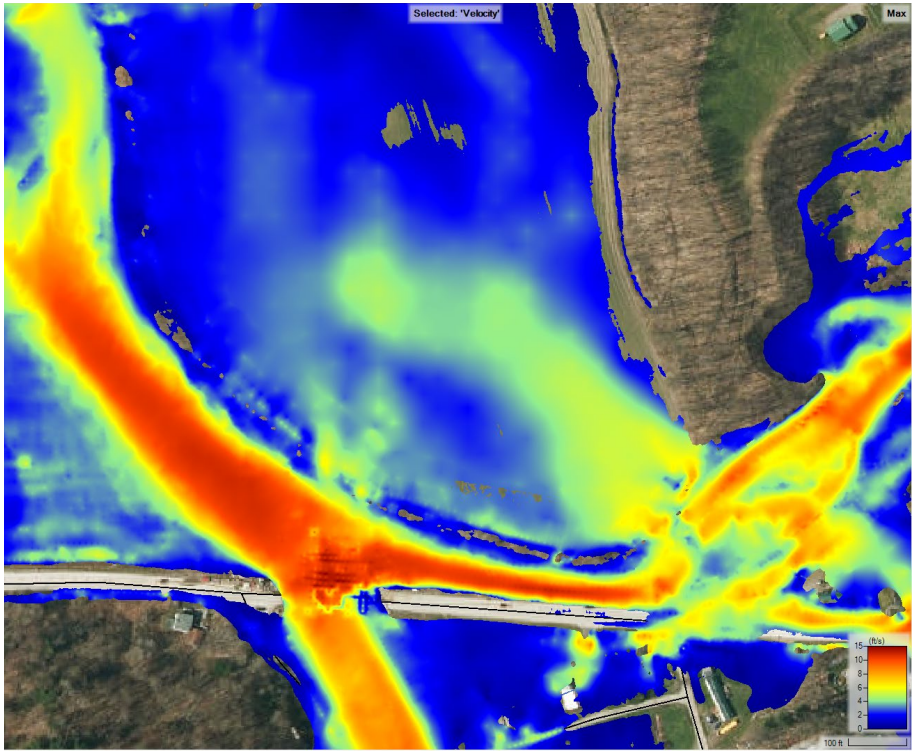
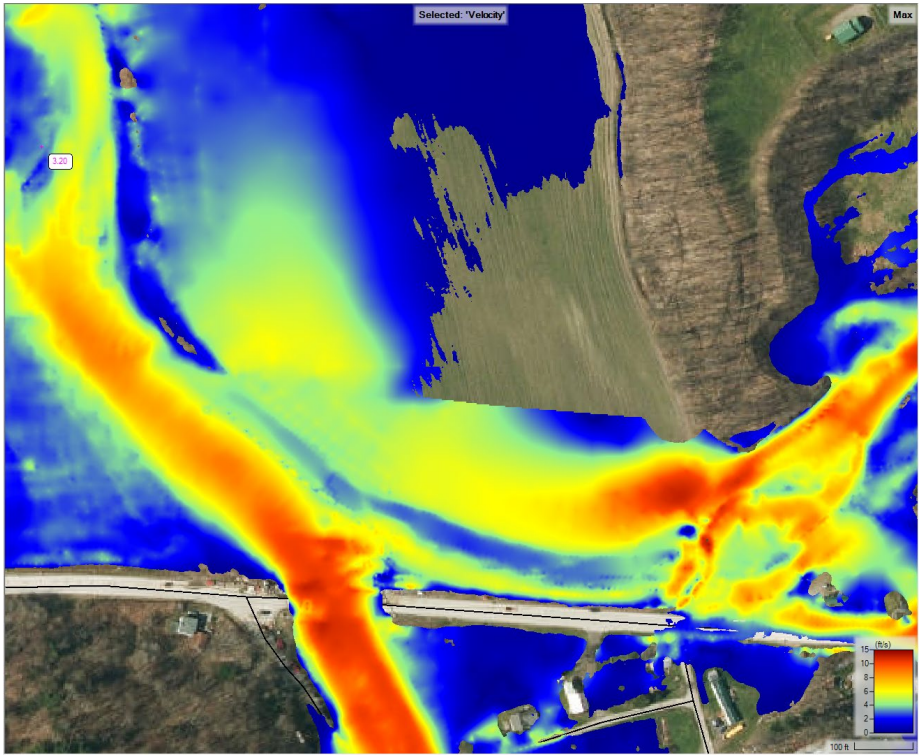


ALTERNATIVE 1 CROSS SECTION 2
SCALE: H: 1"=60', V: 1"=30'

Alternative 1 – Floodplain & Wetland Restoration

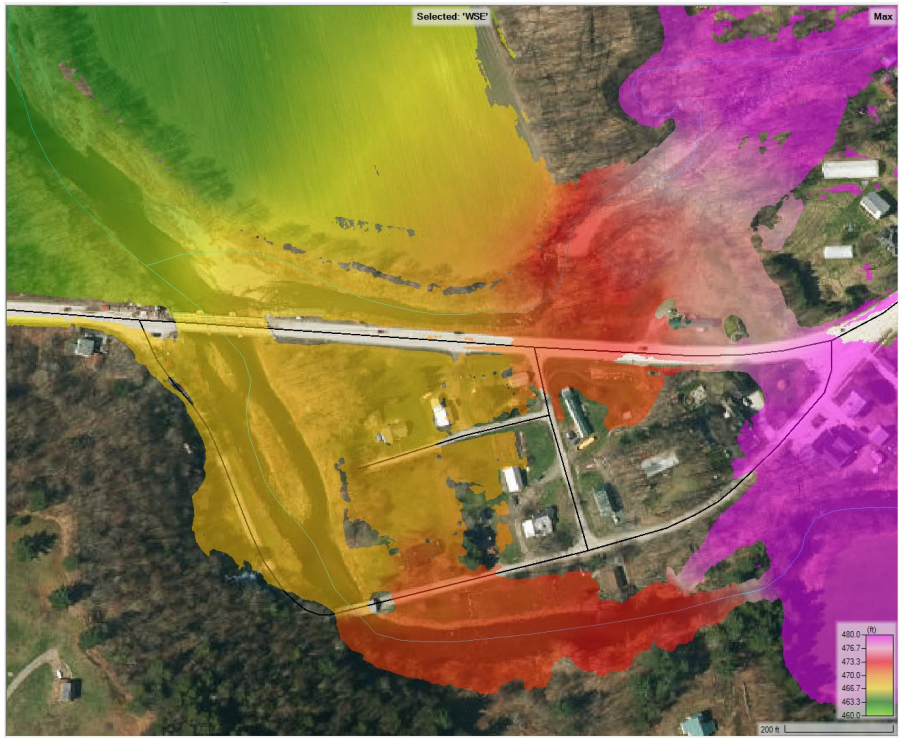
- Reduction of in-channel velocities from 10-13 ft/s to 4-6 ft/s along highway

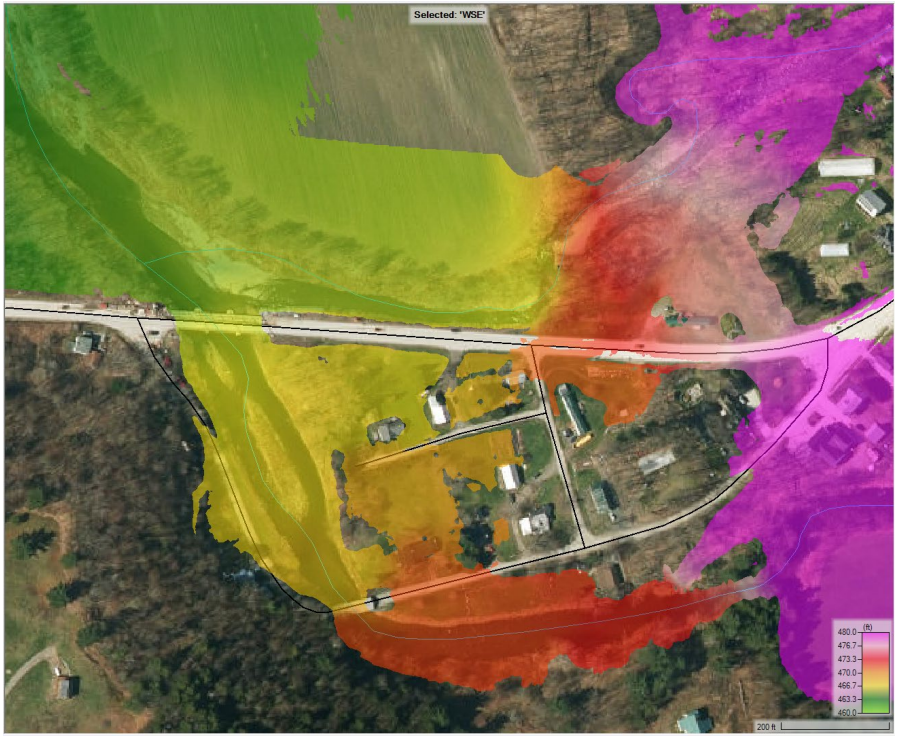




Alternative 1 – Floodplain & Wetland Restoration

- Reduction of depths: 1.4’ DS Rt 118, 2’ at Rt 118 bridge opening, 1.5’ Sylvester Rd.





Alt 1 - Floodplain Restoration Benefits

- Ecosystem benefits of floodplain restoration
- 4.5 acres of floodplain valued by FEMA
- Assumes 25% Open Space and 75% Riparian Restoration
- Reduces velocity on highway

BCR = 2.42 = eligible for FEMA grant review process

- Cost based on low level design
- Cost $1,100,000
- Fill site important for cost
- Includes design and permitting

FEMA BCA Calculator - https://bcaofficeaddin-prod.azurewebsites.net/projects?cpmID=d0d73fa3-b326-4c2c-a05c-d3bf9aecf311&_host_Info=Excel$Win32$16.01$en-US$telemetry$isDialog$$0

FEMA Benefit-Cost Calculator

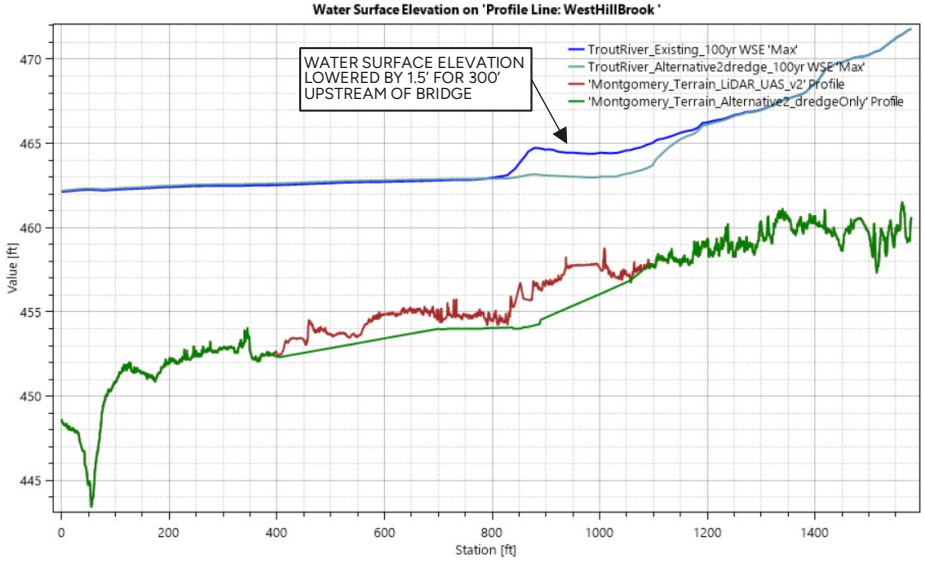
V.6.0 (Build 20241018.1218 | Release Notes)

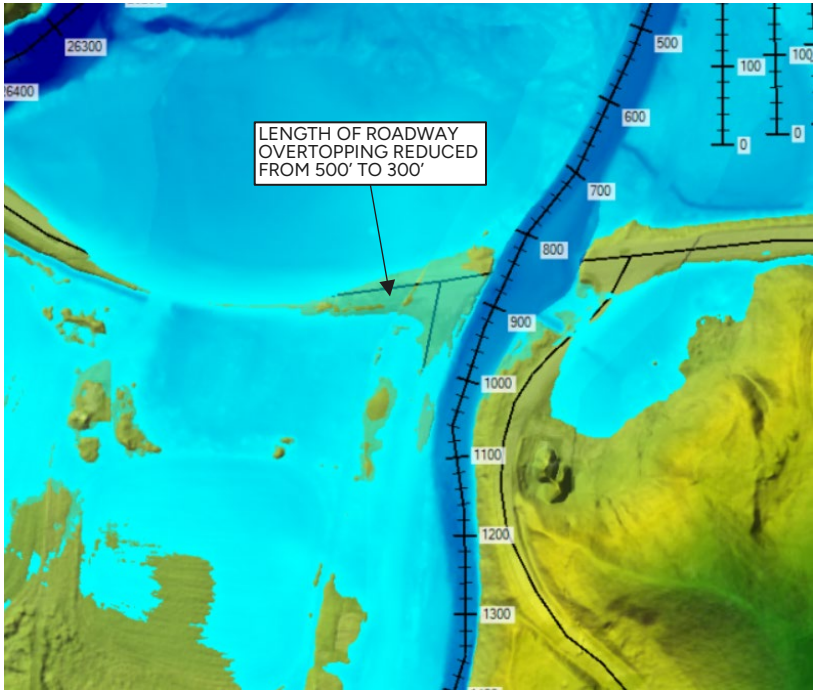
Add Project | Import Projects | Export Projects | Batch Processing | Delete Projects

Select	Project Title	County, State	Benefits (B)	Costs (C)	BCR (B/C)
☑	Floodplain at Town parcel	Franklin, VT	$ 2,660,702	$ 1,100,000	2.42
TOTAL (SELECTED)			$ 2,660,702	$ 1,100,000	2.42
TOTAL			$ 2,660,702	$ 1,100,000	2.42

Alternative 2 – Sediment Management at West Hill Brook Bridge

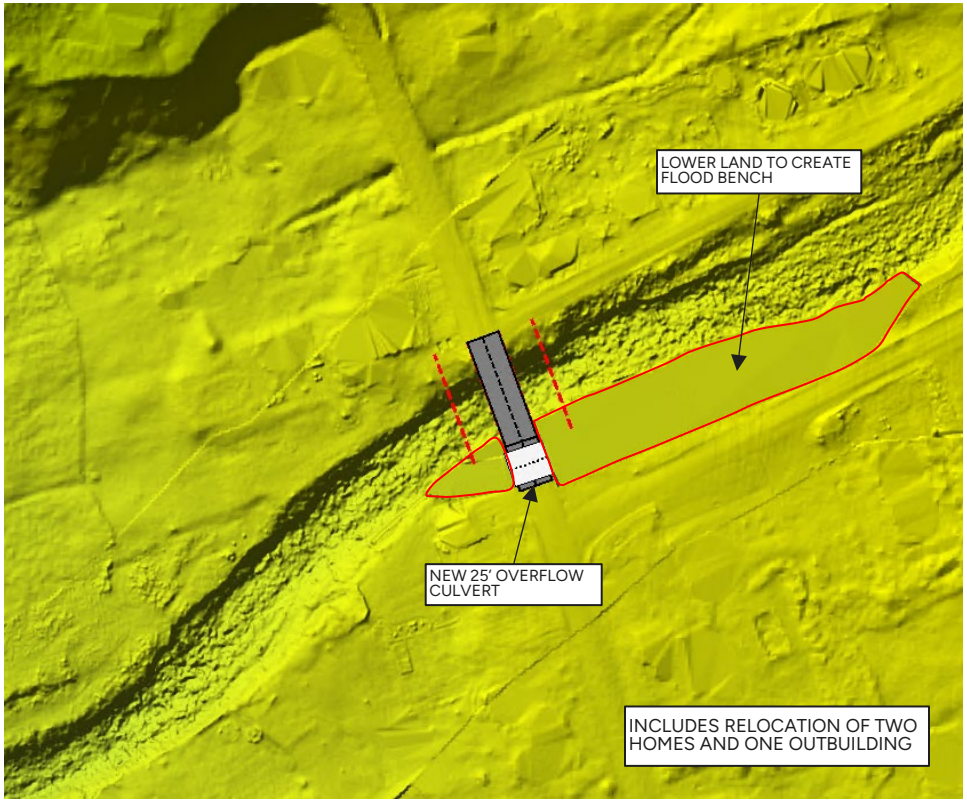
- Modeled removal of accumulated sediment under Route 118 Bridge
- Clear flow impacts localized but reduces potential for clogging with debris



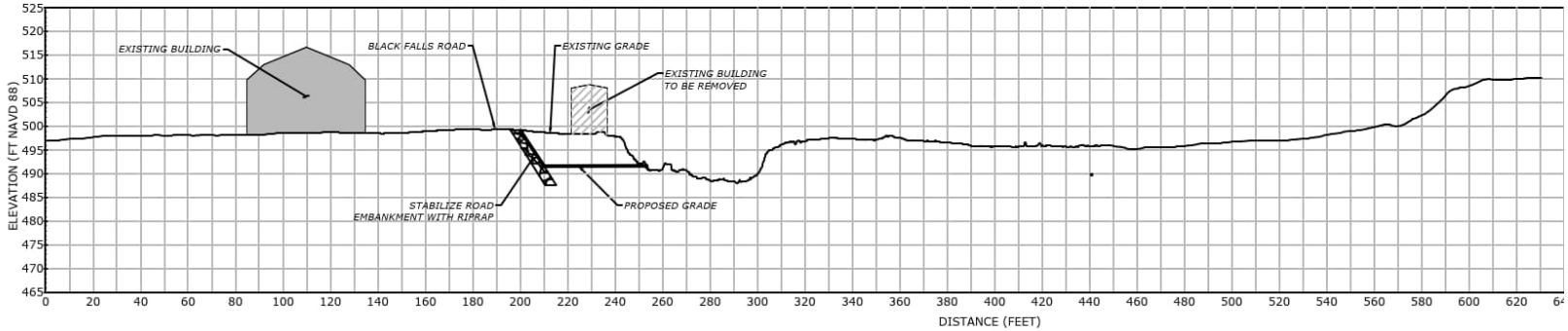


Alternative 7 – Fuller Covered Bridge

- Overflow culvert with flood bench creation
- Prevents water from flooding out of channel on south side of brook at bridge
- Alone, not effective at reducing overall extent of floodwaters in Village



Alternative 7 – Fuller Covered Bridge



ALTERNATIVE 7 CROSS SECTION 1
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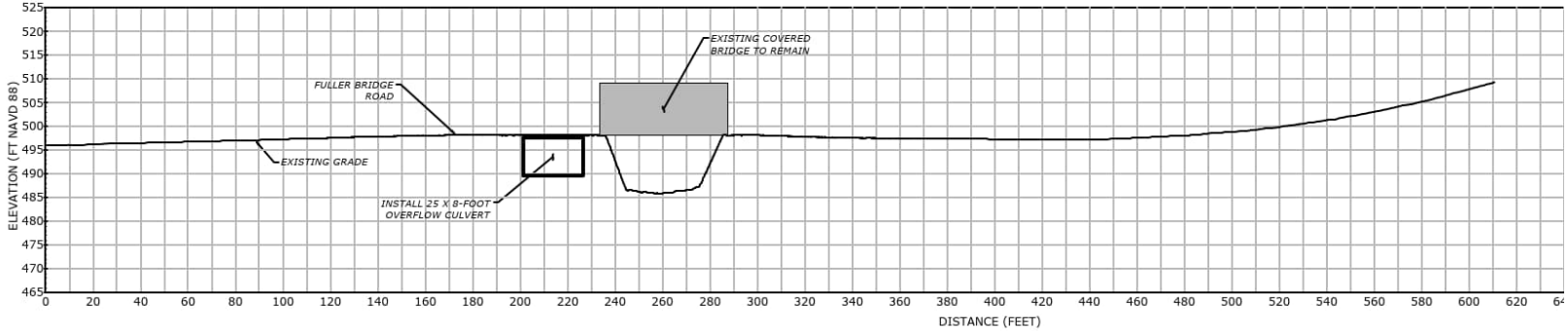
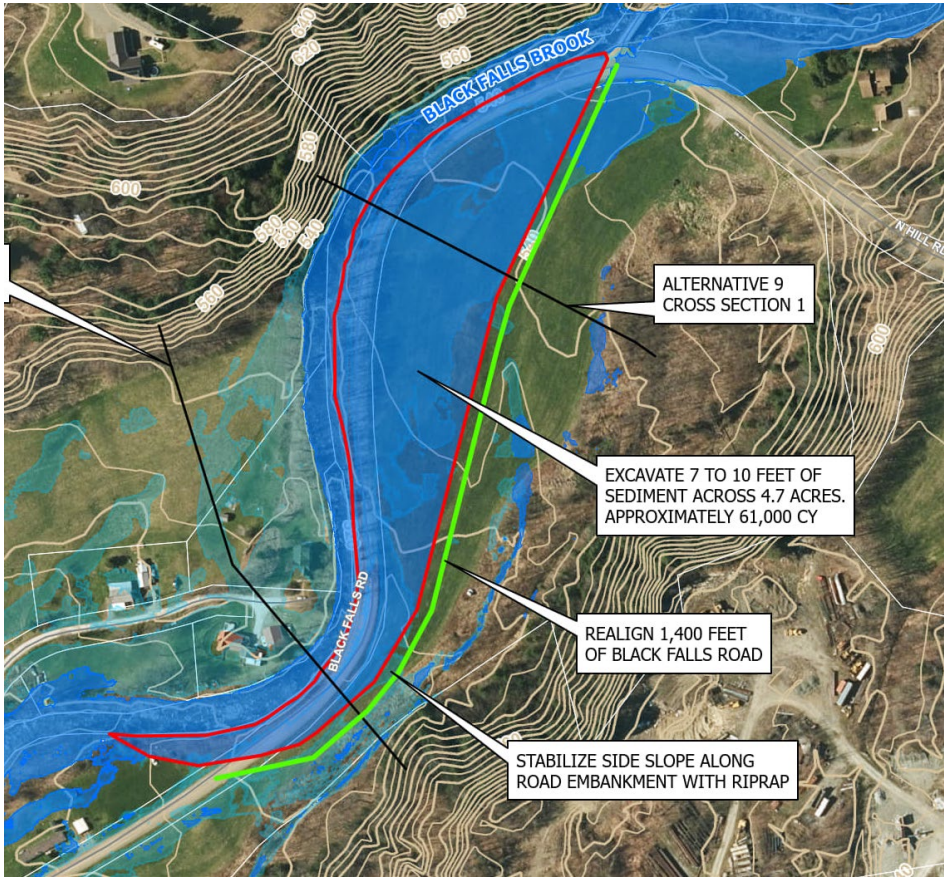


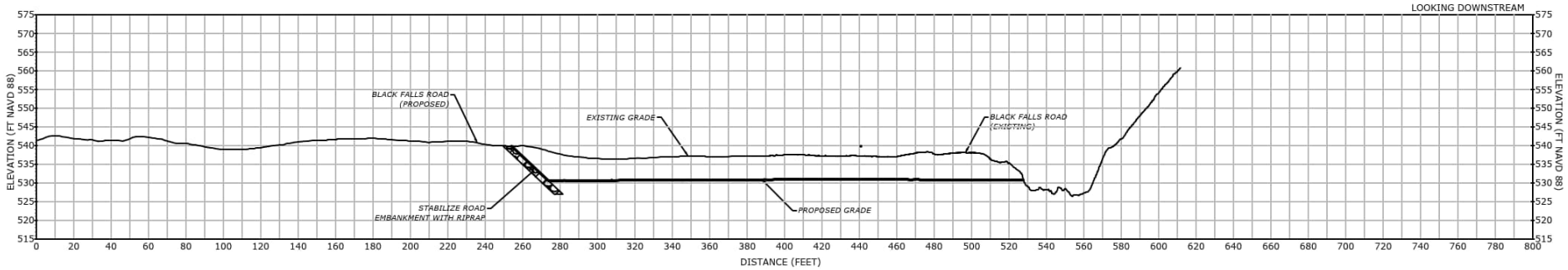
ALTERNATIVE 7 CROSS SECTION 2
SCALE: H: 1"=60', V: 1"=30'

Alternative 9 – Upper Black Falls Floodplain Restoration

- Prevents water from exiting channel and flowing along road into Village
- Substantial reduction in extent of floodwaters in Village
- Reduced footprint since initial alternatives analysis



Alternative 9 – Upper Black Falls Floodplain Restoration



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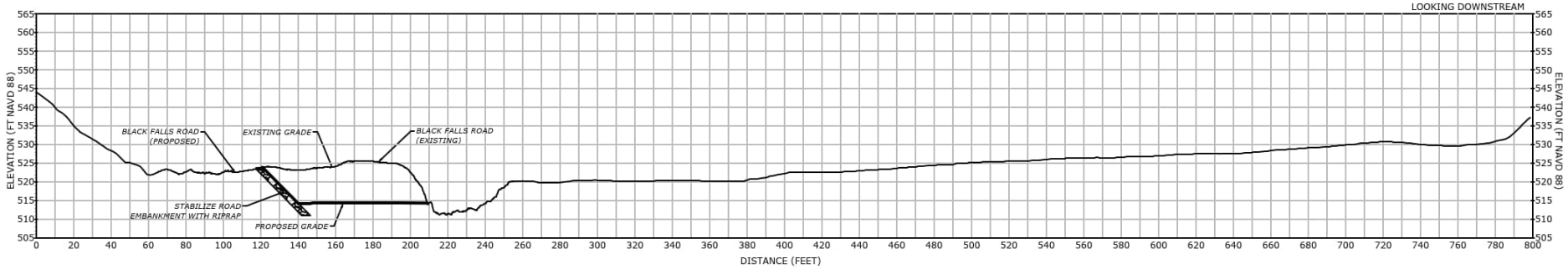

ALTERNATIVE 9 CROSS SECTION 2
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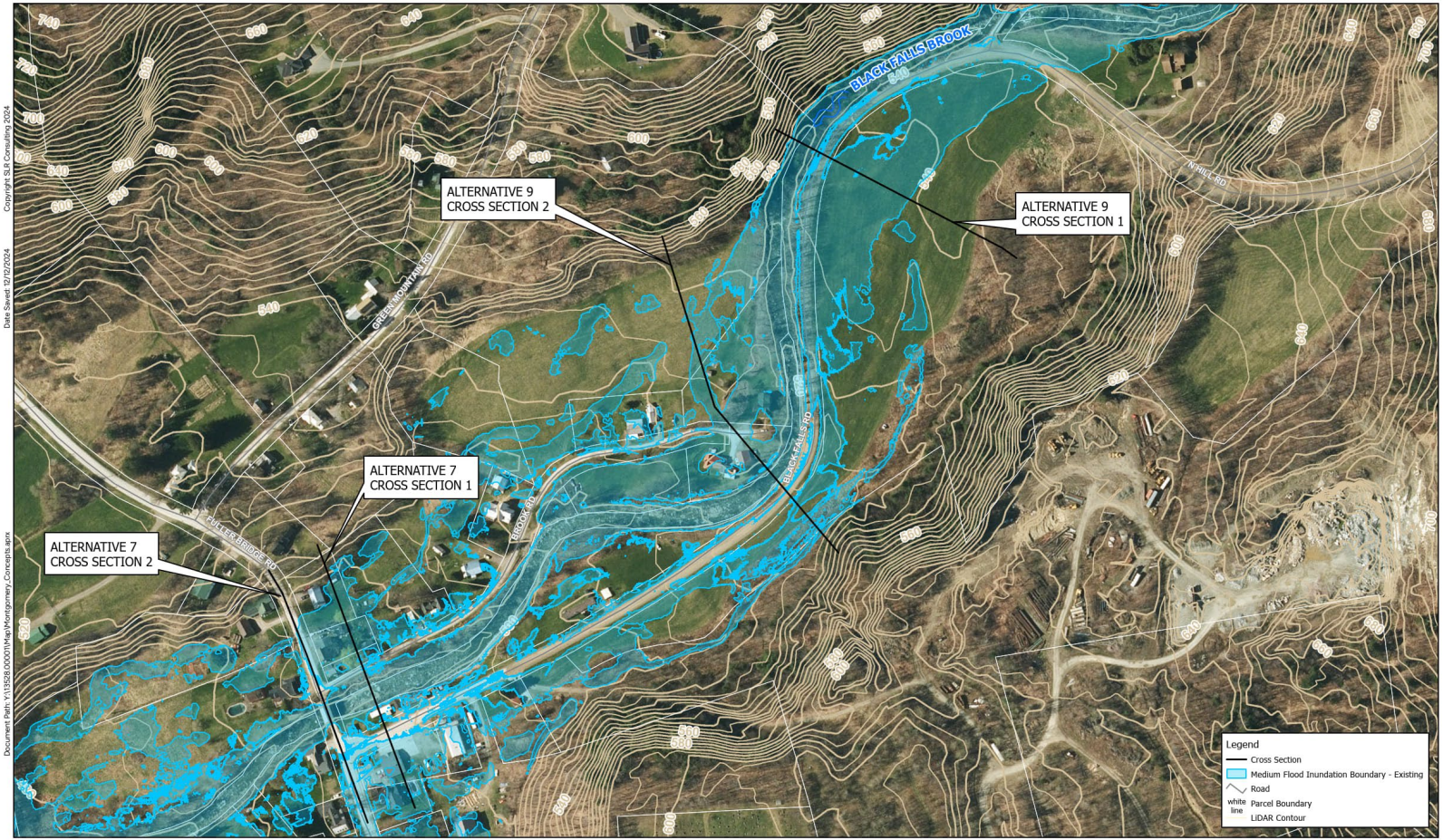

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Document Path: Y:\13528.00001\Map\Montgomery_Concepts.aprx

ALTERNATIVES 7 & 9 - EXISTING CONDITIONS

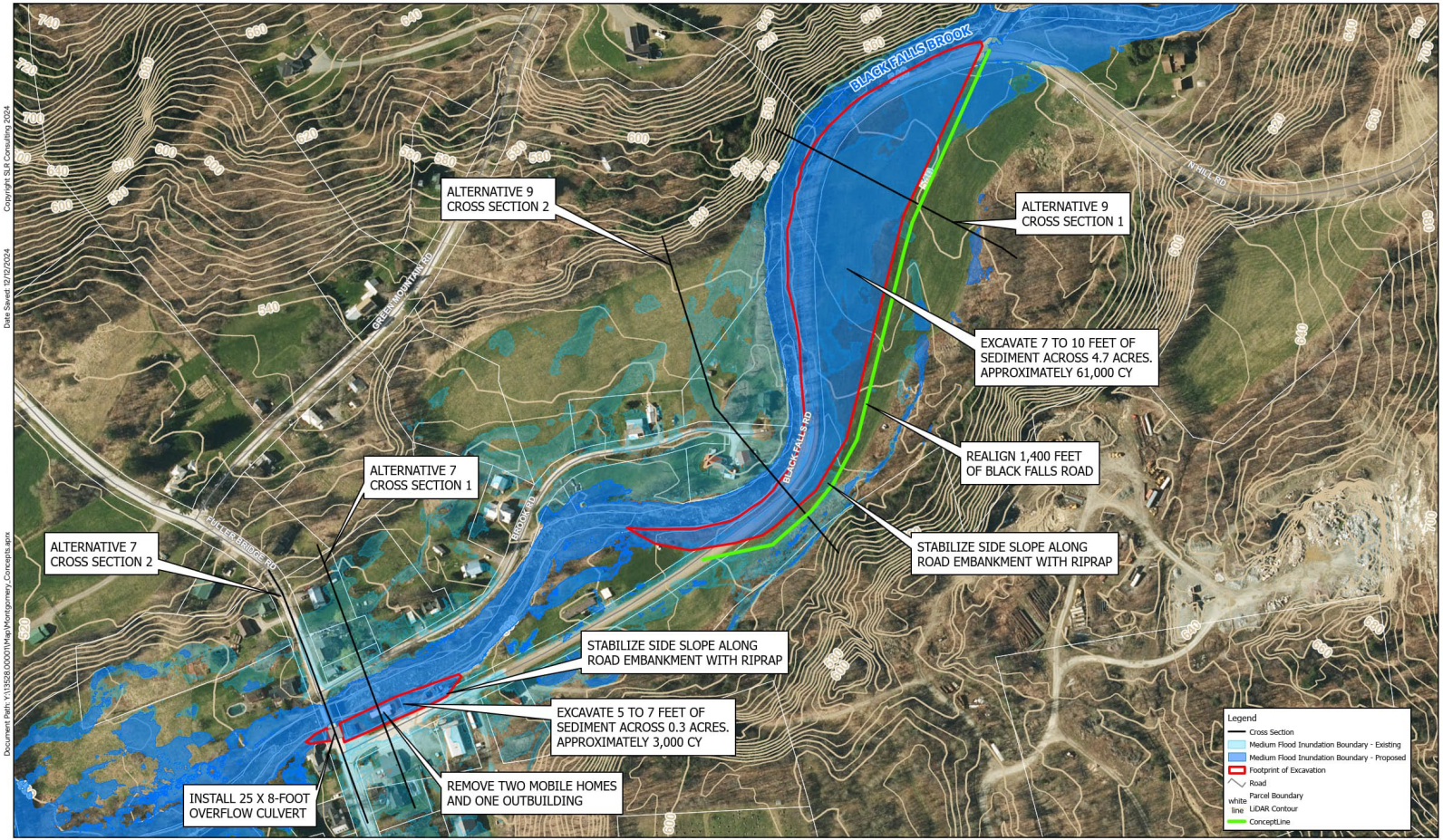
MONTGOMERY FLOOD HAZARD MITIGATION STUDY
FRANKLIN COUNTY NATURAL RESOURCES CONSERVATION DISTRICT

1:2,400

0 200 400
Feet
1 inch = 200 feet

N

SLR
1 SOUTH MAIN STREET
SECOND FLOOR
WATERBURY, VT 05676
802.882.8335



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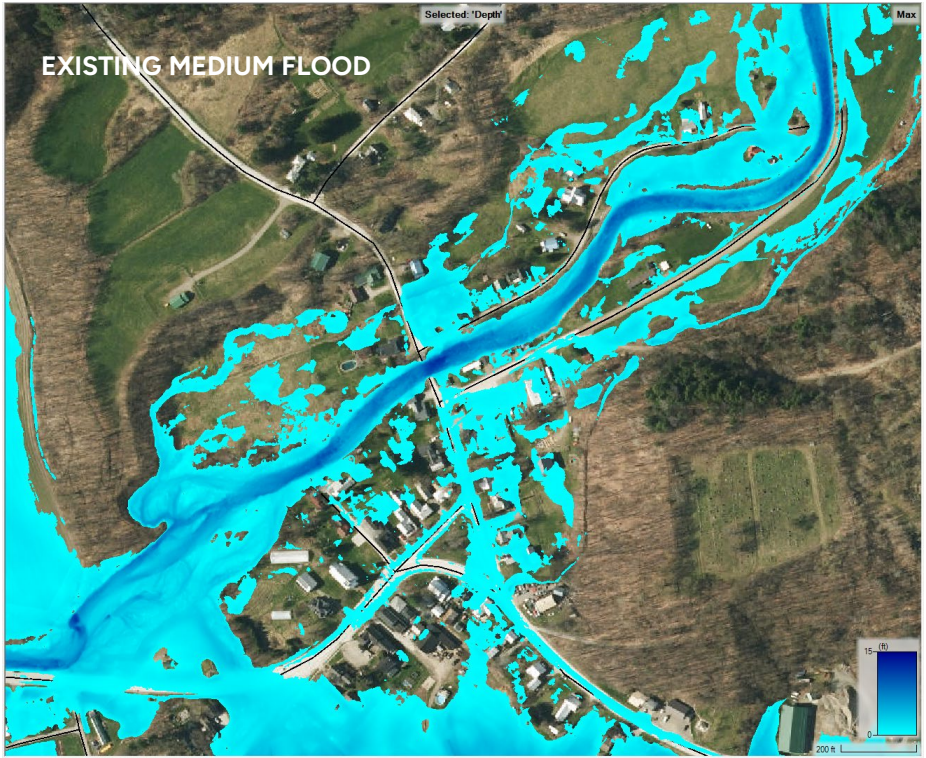
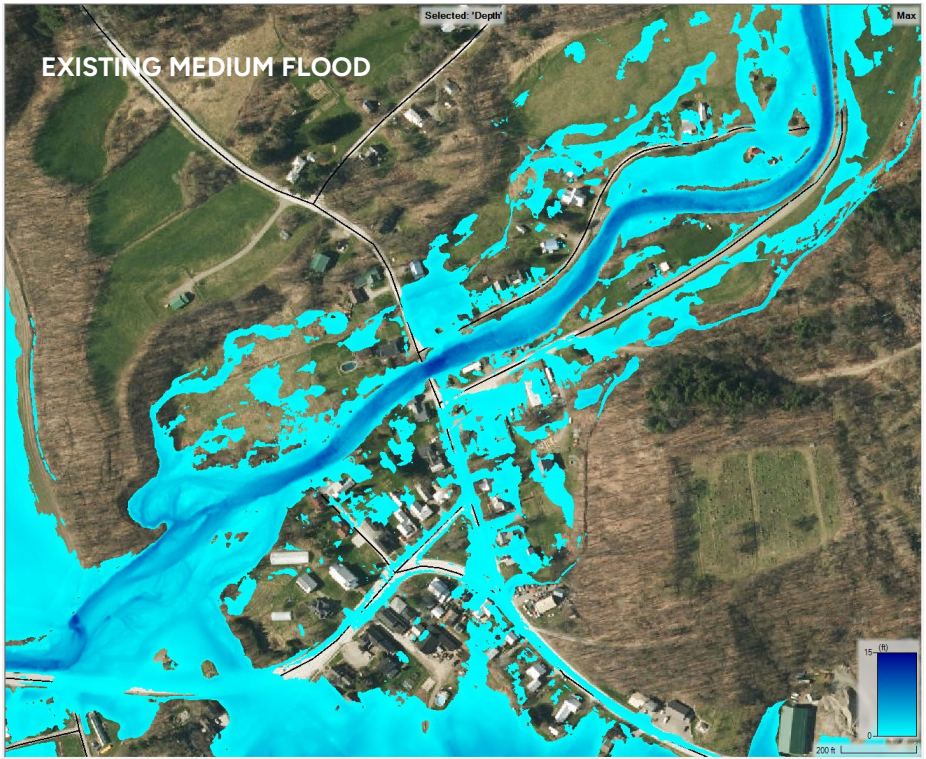
Alternatives 9

- Upper floodplain creation



Alternatives 7 & 9

- Combination of upper floodplain creation and Fuller Covered Bridge overflow culvert



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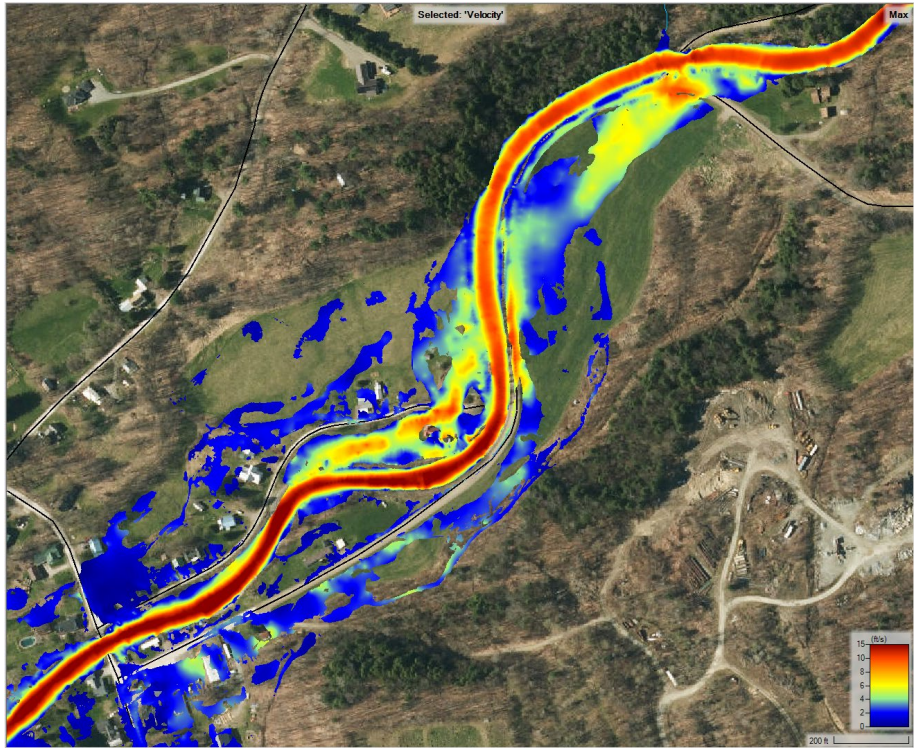
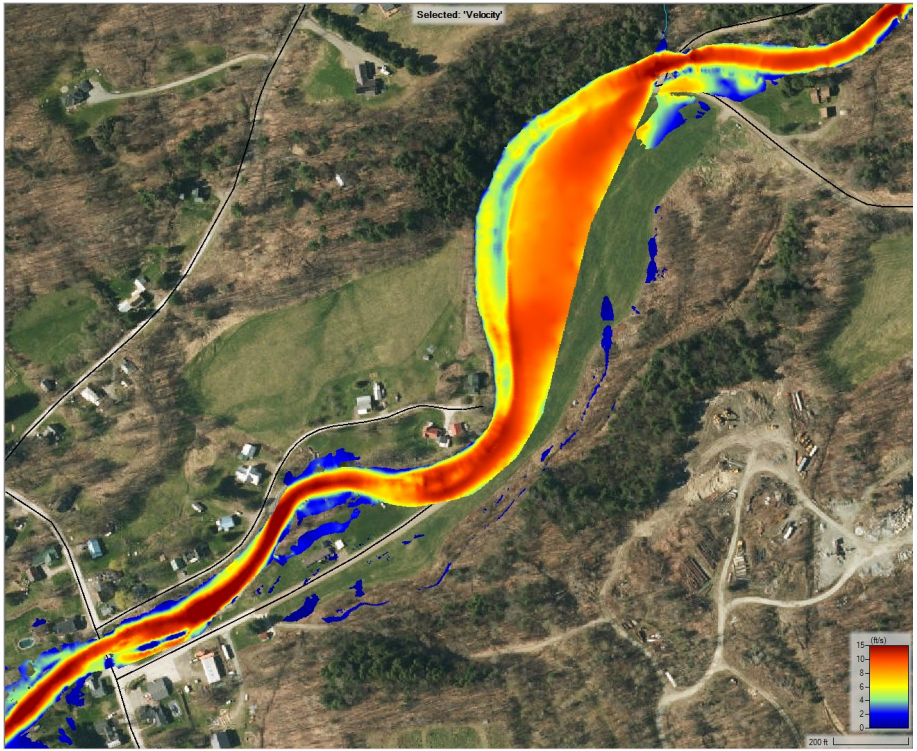
- Combination of upper floodplain creation and Fuller Covered Bridge overflow culvert





Alt 7 & 9 - Floodplain Restoration Benefits

- Ecosystem benefits of floodplain restoration
- 5.0 acres of floodplain valued by FEMA
- Assumes 100% Riparian Restoration

BCR ~ 1.0 = eligible for FEMA grant review process

- Cost based on low level design
- Cost $1 - 1,500,000 culvert
- Cost $2 – 3,000,000 for floodplain
- Fill site important for cost
- Includes design and permitting
- Benefits to buildings not included

FEMA BCA Calculator - https://bcaofficeaddin-prod.azurewebsites.net/projects?cpmID=287aa596-4dff-4d9f-a163-225c48

FEMA Benefit-Cost Calculator
V.6.0 (Build 20241018.1218 | Release Notes)

Add Project | Import Projects | Export Projects | Batch Processing | Delete Pro

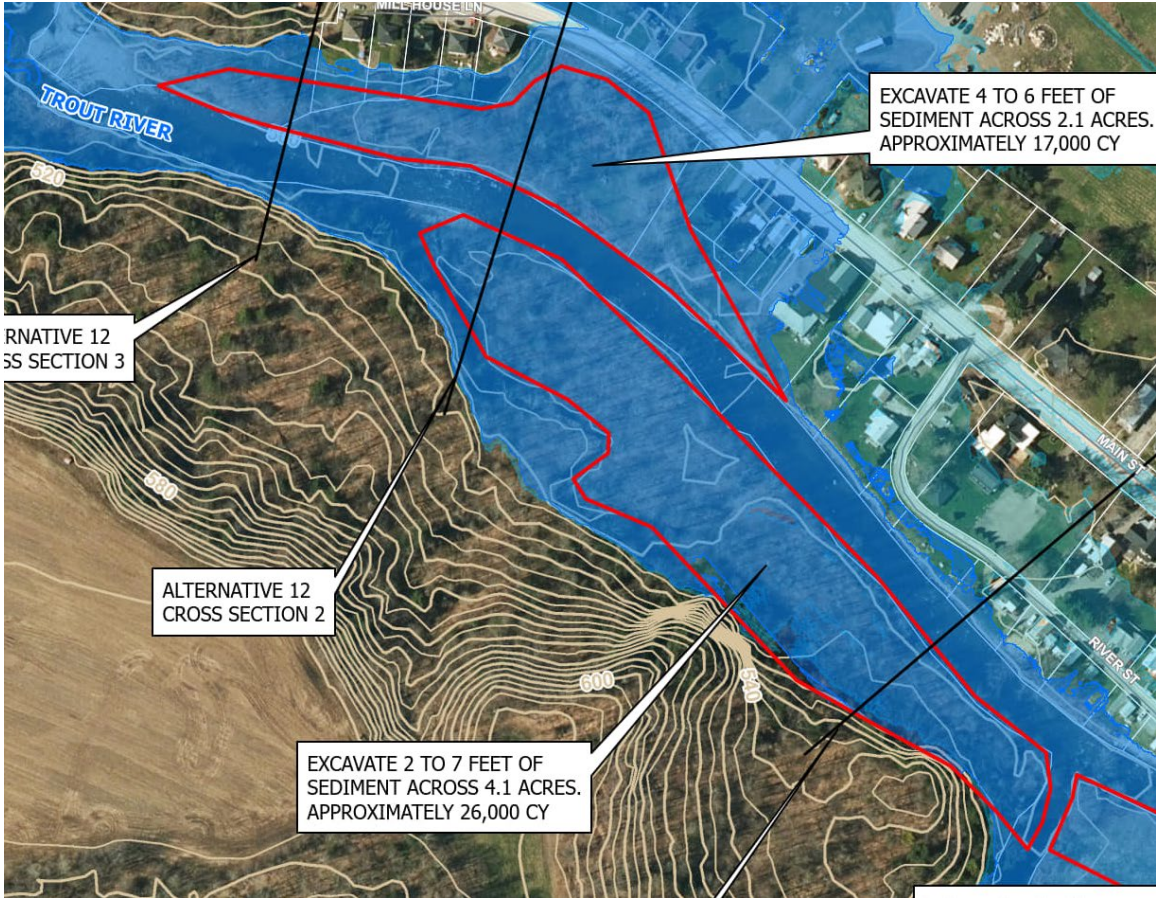
Select	Project Title	County, State	Benefits (B)	Costs (C)	BCR (B/
☑	Fuller Bridge and Upper Black Falls Brook	Franklin, VT	$ 3,598,908	$ 3,700,000	0.97
TOTAL (SELECTED)			$ 3,598,908	$ 3,700,000	0.97
TOTAL			$ 3,598,908	$ 3,700,000	0.97

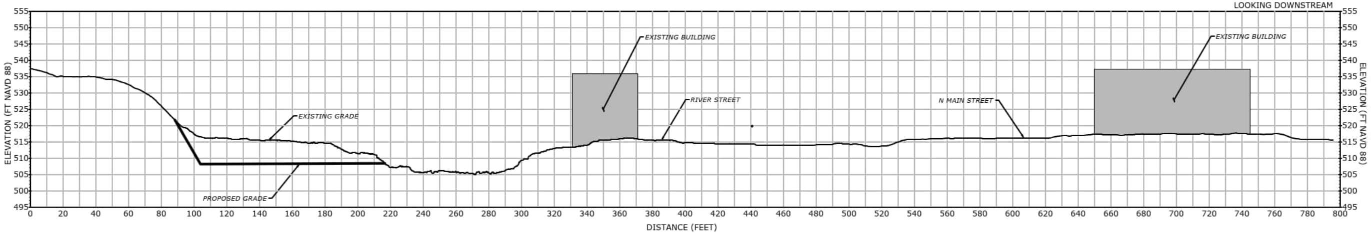
Alternative 11

- No reduction in extent of flooding
- Effects carry 1,300 feet upstream but do not reach Center homes and businesses
- May not need to be done, as the upstream alternatives are very effective without it.

Alternative 12

- Added northern floodplain since alternatives discussion
- Floodplain lowering benefits nearby homes the most





ALTERNATIVE 12 CROSS SECTION 1
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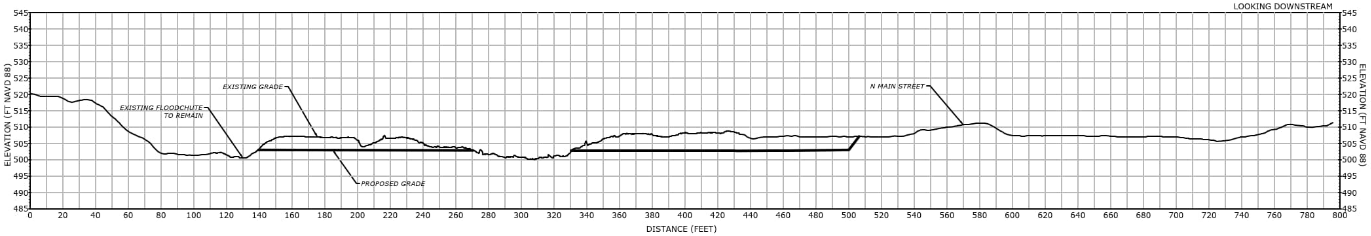

ALTERNATIVE 12 CROSS SECTION 2
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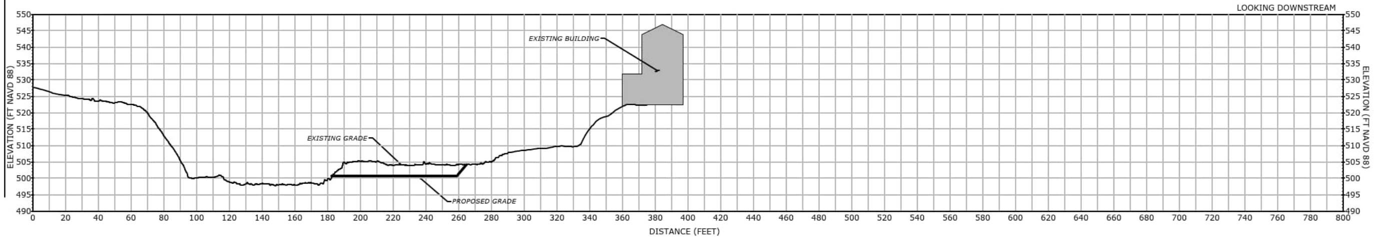


ALTERNATIVE 12 CROSS SECTION 3
SCALE: H: 1"=60', V: 1"=30'

SLR

REVISIONS

CONCEPT DESIGN

TYPICAL SECTIONS - ALTERNATIVE 12
MONTGOMERY FLOOD HAZARD MITIGATION STUDY
MONTGOMERY CENTER
MONTGOMERY, VERMONT

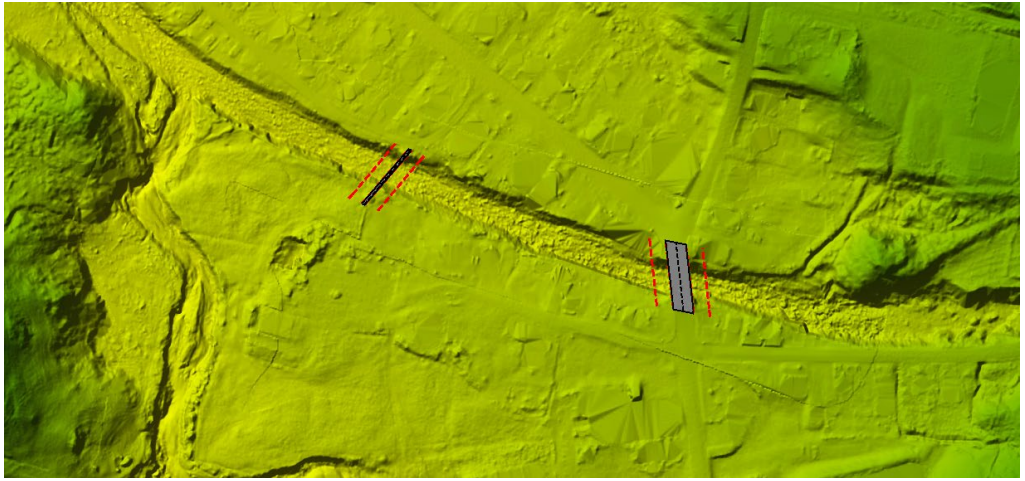
DESIGNED	DRAWN	CHECKED
AOM	AOM	JCL

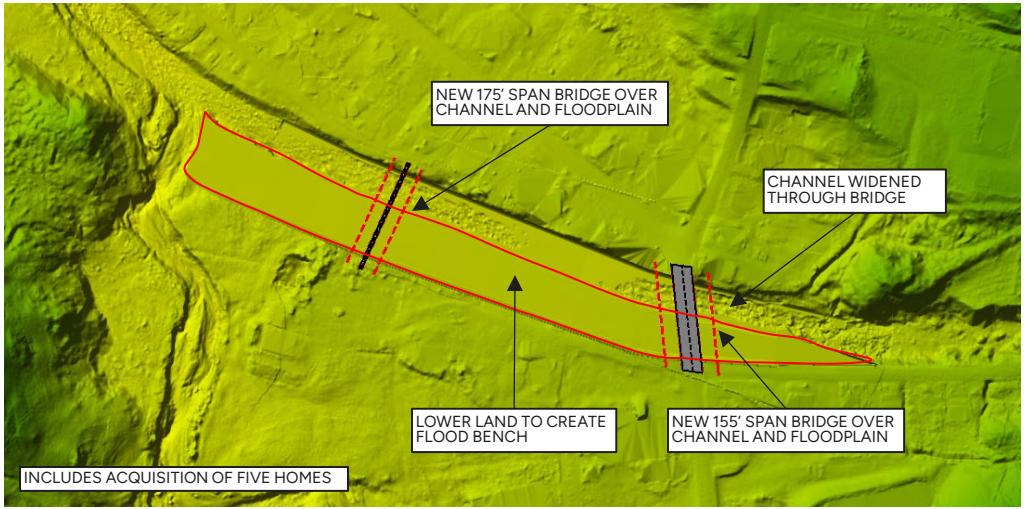
SCALE: AS NOTED
DATE: DECEMBER 12, 2024
PROJECT NO. 13528.00001
SHEET NO. XS-1

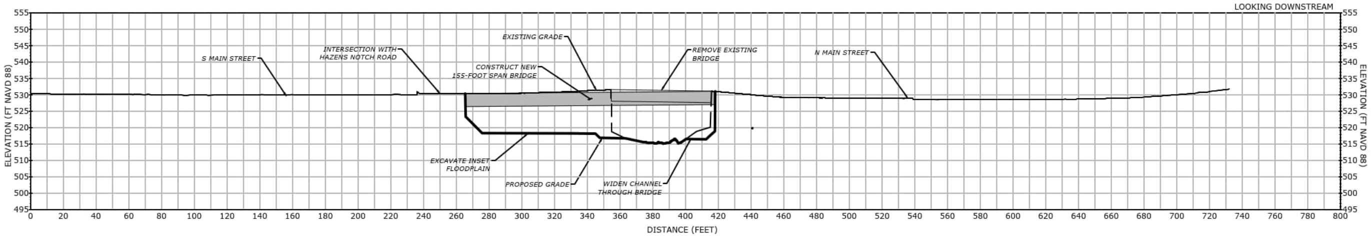
Plotted by: AMARCUCCI On this date: Thu, 2024 December 12 - 8:16am

Alternative 15

- South Main Street Bridge upsized from 60’ to 155’
- Snowmobile bridge upsized from 100’ to 175’
- Flood bench created along south side of Trout River







ALTERNATIVE 15 CROSS SECTION 1

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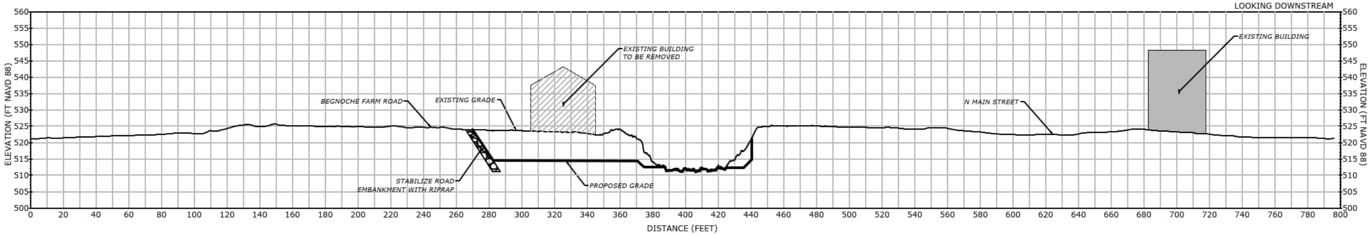
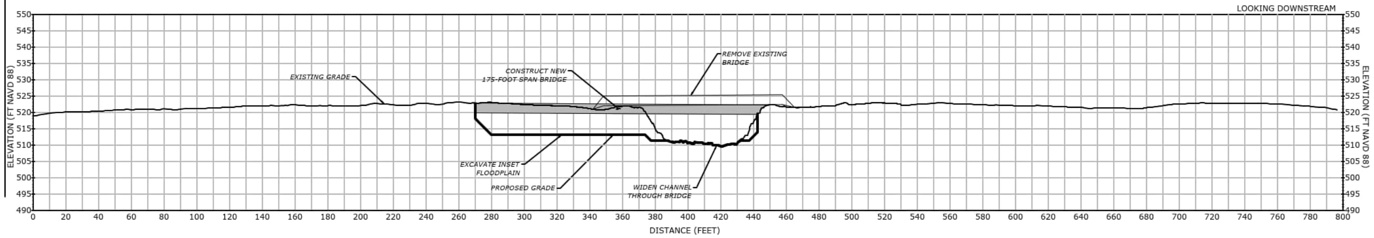


ALTERNATIVE 15 CROSS SECTION 2

SCALE: H: 1"=60', V: 1"=30'



ALTERNATIVE 15 CROSS SECTION 3

SCALE: H: 1"=60', V: 1"=30'

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1 SOUTH MAIN STREET
WATERBURY, VT 05676
802.882.8335
SLRCONSULTING.COM

REVISIONS

CONCEPT DESIGN

TYPICAL SECTIONS - ALTERNATIVE 15

MONTGOMERY FLOOD HAZARD MITIGATION STUDY

MONTGOMERY CENTER
MONTGOMERY, VERMONT

DESIGNED	DRAWN	CHECKED
AOM	AOM	JCL

SCALE: AS NOTED

DATE: DECEMBER 12, 2024

PROJECT NO. 13528.00001

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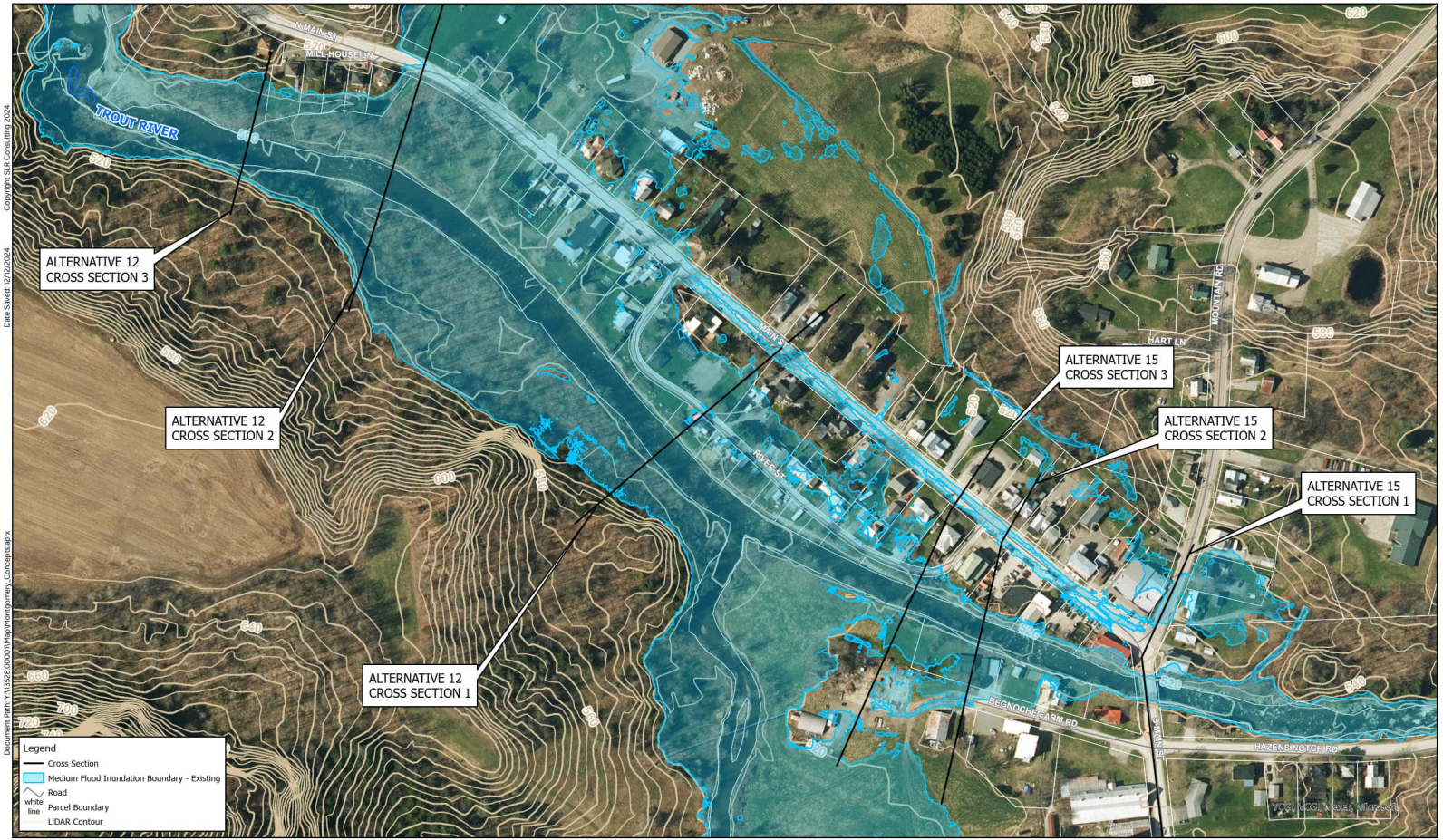
Plotted by: AMARCUCCI On this date: Thu, 2024 December 12 – 8:16am



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ALTERNATIVES 12 & 15 - EXISTING CONDITIONS

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FRANKLIN COUNTY NATURAL RESOURCES CONSERVATION DISTRICT

1:2,400

0 200 400

Feet

1 inch = 200 feet

N

SLR

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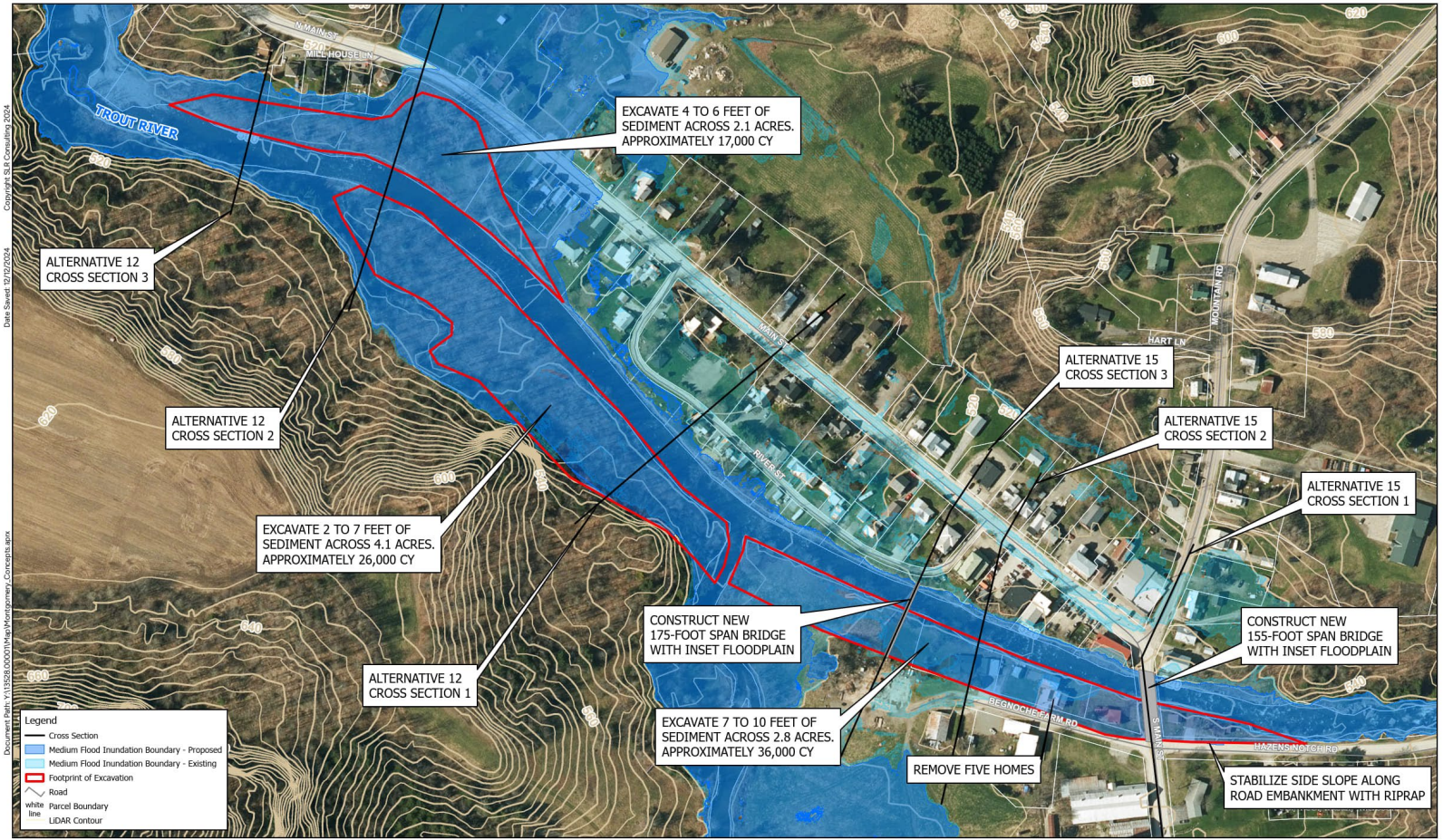

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Alternatives 12 & 15 with and without 11

RASMapper Plot

Plot | Table

Water Surface Elevation on 'Profile Line: TroutRiverProfile '

TroutRiver_Alternative215CV_Center_100yr WSE 'Max'
TroutRiver_Existing_100yr WSE 'Max'
TroutRiver_Alternative15CenterFP$_100yr WSE 'Max'
'Montgomery_Terrain_Alternative215_overflowCV_Center' Profile
'Montgomery_Terrain_LiDAR_UAS_v2' Profile
'Montgomery_Terrain_Alternative9_rev_wCenterFPall' Profile

SOUTH MAIN ST BRIDGE

SNOWMOBILE BRIDGE

EXTEND OF BENEFIT OF NATURAL CONSTRICTION DREDGING

NATURAL CONSTRICTION

EXTEND OF BENEFIT OF NATURAL CONSTRICTION DREDGING

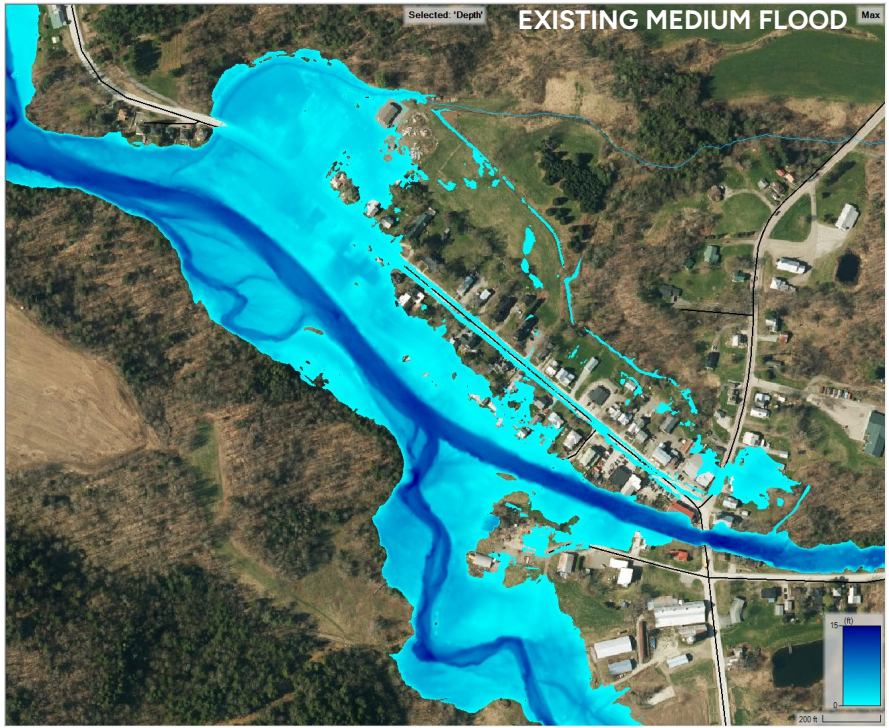
550
540
530

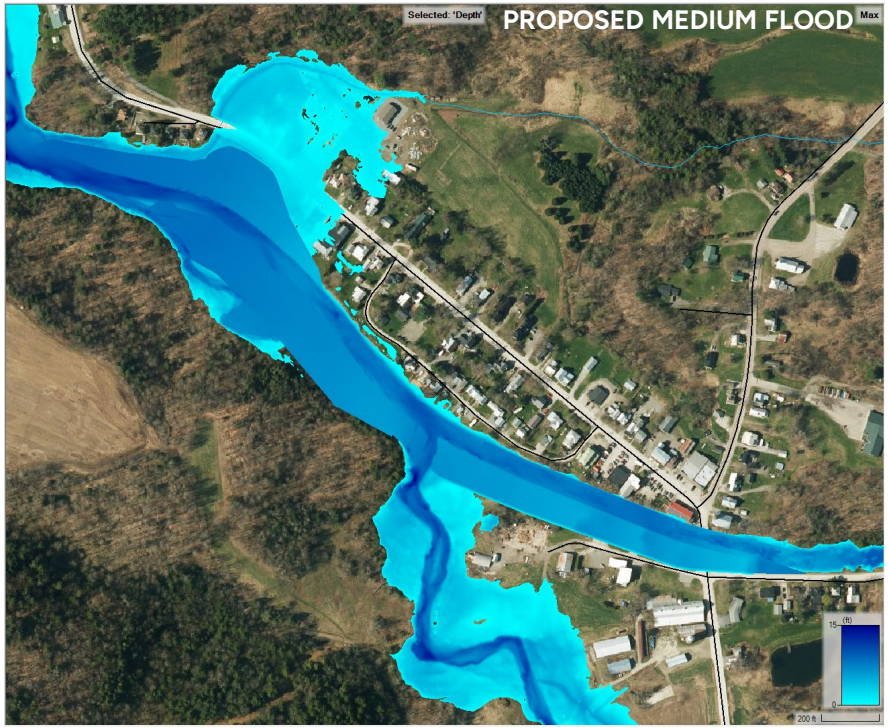
5000 5500 6000 6500 7000 7500 8000 8500 9000

Station [ft]

Alternative 12 & 15

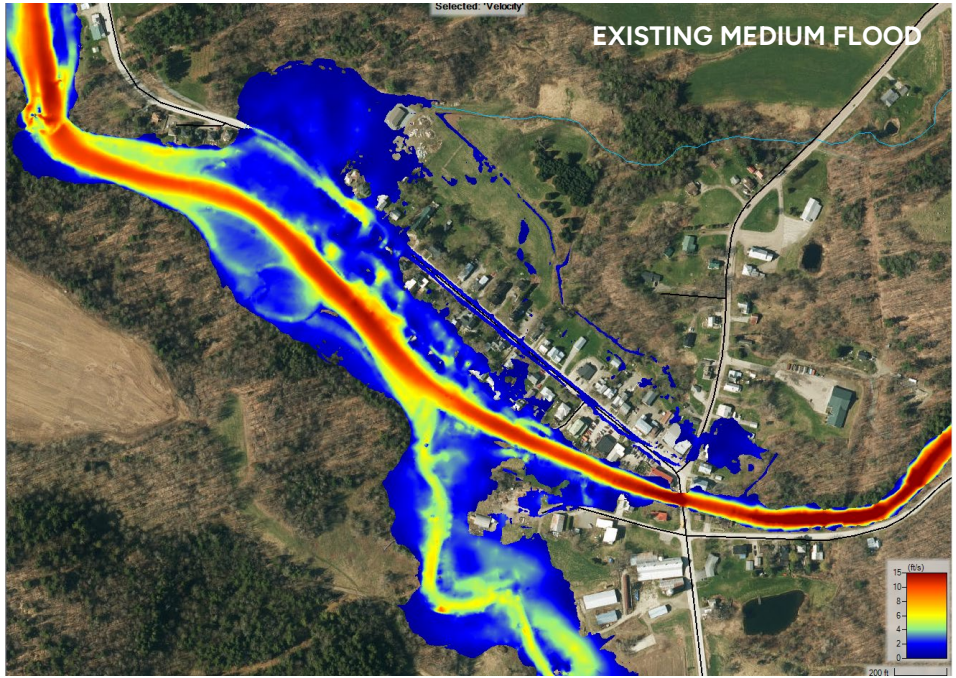
- Reduction in flood depths 1-2’ downstream South Branch and 4-5 feet for 1,000’ to upstream of South Main Street

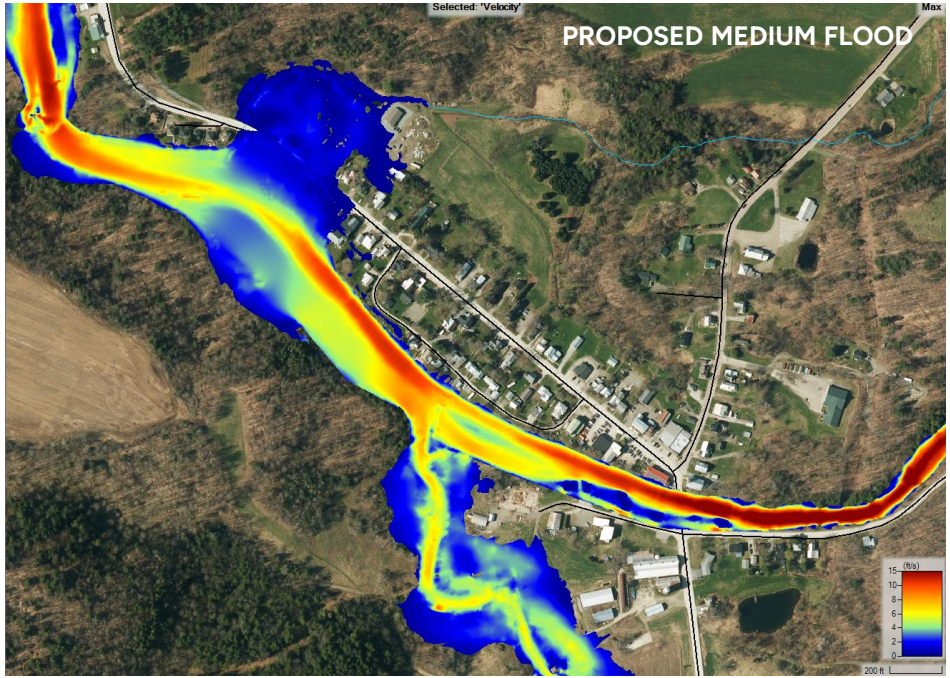




Alternative 12 & 15

- In-channel velocities reduced in vicinity of bridges and homes (17 to 14ft/s at S Main St Bridge, 10-12ft/s to 7-9ft/s along River Street)



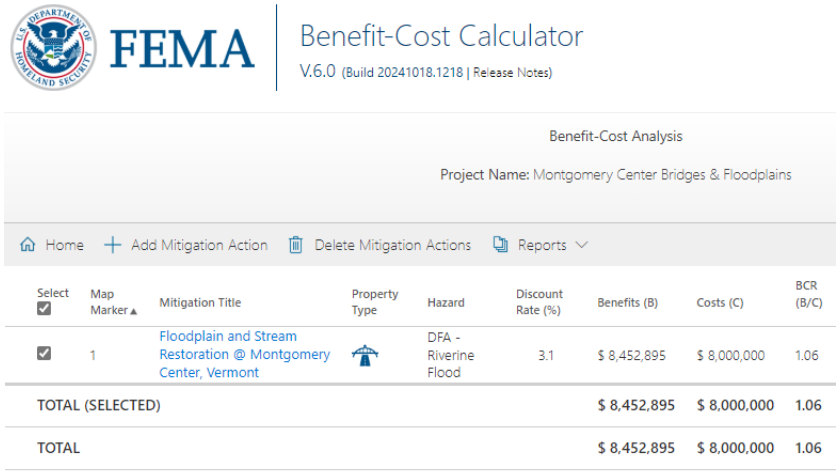


Alt 12 & 15 - Floodplain Restoration Benefits

- Ecosystem benefits of floodplain restoration
- 9.0 acres of floodplain valued by FEMA
- Assumes 100% Riparian Restoration

BCR > 1.1 = eligible for FEMA

- Cost based on low level design
- Cost ~$1,500,000 Alt 12
- Cost $6,000,000 - $7,000,000 for Alt 15
- Fill site important for cost
- Includes design and permitting
- Benefits to buildings not included



FEMA Benefit-Cost Calculator

V.6.0 (Build 20241018.1218 | Release Notes)

Benefit-Cost Analysis

Project Name: Montgomery Center Bridges & Floodplains

Home | Add Mitigation Action | Delete Mitigation Actions | Reports

Select	Map Marker	Mitigation Title	Property Type	Hazard	Discount Rate (%)	Benefits (B)	Costs (C)	BCR (B/C)
☑	1	Floodplain and Stream Restoration @ Montgomery Center, Vermont		DFA - Riverine Flood	3.1	$ 8,452,895	$ 8,000,000	1.06
TOTAL (SELECTED)						$ 8,452,895	$ 8,000,000	1.06
TOTAL						$ 8,452,895	$ 8,000,000	1.06

Do you have any questions?